

ADDITIONS SHOWN IN DOUBLE-UNDERLINE; DELETIONS SHOWN IN STRIKETHROUGH

1. Page 5, section II.A, first paragraph: delete active ingredients bifenthrin, carbaryl, chlorpyrifos, cyfluthrin, cypermethrin, and diflubenzuron.

This General Permit covers the point source discharge of biological and residual pesticides resulting from direct and spray applications for vector control using: 1) larvicides containing monomolecular films, methoprene, *Bacillus thuringiensis* subspecies *israelensis* (or *Bti*), *Bacillus sphaericus* (or *B. Sphaericus*), temephos, ~~diflubenzuron~~, petroleum distillates, or spinosad; and 2) adulticides containing ~~chlorpyrifos~~, malathion, naled, pyrethrin, ~~bifenthrin~~, ~~cyfluthrin~~, ~~cypermethrin~~, deltamethrin, etofenprox, lambda-cyhalothrin, permethrin, prallethrin, resmethrin, sumithrin, piperonyl butoxide (PBO), or N-octyl bicycloheptene dicarboximide (or MGK-264), ~~or carbaryl~~.

2. Page 6, section II.A: amend second paragraph as shown below.

Larvicides and adulticides that are currently registered by DPR and new larvicides and adulticides that will be registered by DPR using these same active ingredients listed above may be used for vector control applications. The State Water Board will review all newly DPR-registered active ingredients and all newly DPR-registered products based on currently DPR-registered active ingredients for vector control to determine their potential impacts to waters of the United States. The State Water Board may reopen this General Permit to add new active ingredients that DPR registers ~~for use in larvicides and adulticides~~ for vector control.

3. Page 17, Table 3-Receiving Water Limitations: delete carbaryl, chlorpyrifos, and cypermethrin from the table.

Table 3. Receiving Water Limitations

Ingredient	Unit	Instantaneous Maximum	Basis
Carbaryl	µg/L	2.1 (Freshwater)	U.S. EPA's Ambient Water Quality Criteria
		0.81 (Saltwater)	California Department of Fish and Wildlife's Ambient Criterion
Chlorpyrifos	µg/L	0.014 (Freshwater)	California Department of Fish and Wildlife's Ambient Criterion
		0.0056 (Saltwater)	U.S. EPA's National Recommended Water Quality Criteria
Cypermethrin	µg/L	0.002	California Department of Fish and Wildlife's

Ingredient	Unit	Instantaneous Maximum	Basis
			Ambient Criterion
Malathion	µg/L	0.1	U.S. EPA's Ambient Water Quality Criteria

4. Page 18, Table 4-Receiving Water Monitoring Triggers: Delete diflubenzuron, bifenthrin, and cyfluthrin from the table. Change permethrin's instantaneous maximum monitoring trigger to 0.0019 ug/L and its basis to U.S. EPA's Office of Pesticides' Ecotoxicity Database.

Table 4. Receiving Water Monitoring Triggers

<u>Pesticide Type</u>	<u>Active Ingredient</u>	Unit	Instantaneous Maximum Monitoring Triggers	Basis
Larvicides	Diflubenzuron	µg/L	0.064	U.S. EPA's Office of Pesticides' Ecotoxicity Database
	Temephos	µg/L	8	U.S. EPA's Office of Pesticides' Ecotoxicity Database
Adulticides	Naled	µg/L	0.014	U.S. EPA's Office of Pesticides' Ecotoxicity Database
	Pyrethrin	µg/L	0.14	U.S. EPA's Office of Pesticides' Ecotoxicity Database
	Bifenthrin	µg/L	0.0019	U.S. EPA's Office of Pesticides' Ecotoxicity Database
	Cyfluthrin	µg/L	0.00022	U.S. EPA's Office of Pesticides' Ecotoxicity Database
	Deltamethrin	µg/L	0.00017	U.S. EPA's Office of Pesticides' Ecotoxicity Database
	Etofenprox	µg/L	0.0019	U.S. EPA's Office of Pesticides' Ecotoxicity Database
	Lambda-Cyhalothrin	µg/L	0.00041	U.S. EPA's Office of Pesticides' Ecotoxicity Database

<u>Pesticide Type</u>	<u>Active Ingredient</u>	<u>Unit</u>	<u>Instantaneous Maximum Monitoring Triggers</u>	<u>Basis</u>
Adukticides	Permethrin	µg/L	0.03 <u>0.0019</u>	California Department of Fish and Game Wildlife's Ambient Criterion <u>U.S. EPA's Office of Pesticides' Ecotoxicity Database</u>
	Prallethrin	µg/L	0.39	U.S. EPA's Office of Pesticides' Ecotoxicity Database
	Resmethrin	µg/L	0.028	U.S. EPA's Office of Pesticides' Ecotoxicity Database
	Sumithrin	µg/L	0.0025	U.S. EPA's Office of Pesticides' Ecotoxicity Database

5. Page D-16, Attachment D, section III.A.2, second sentence: delete the active ingredients diflubenzuron, chlorpyrifos, bifenthrin, cyfluthrin, cypermethrin, and carbamate carbaryl.

This General Permit covers the point source discharge of biological and residual pesticides resulting from direct and spray applications for vector control using: 1) larvicides containing monomolecular films, methoprene, *Bacillus thuringiensis* subspecies *israelensis* (or *Bt*), *Bacillus sphaericus* (or *B. sphaericus*), petroleum distillates, temephos, ~~diflubenzuron~~, and spinosad; and 2) adulticides containing organophosphates ~~chlorpyrifos~~, malathion, and naled; pyrethrin; pyrethroids ~~bifenthrin, cyfluthrin, cypermethrin~~, deltamethrin, etofenprox, lambda-cyhalothrin, permethrin, prallethrin, resmethrin, and sumithrin;; synergists piperonyl butoxide (PBO) and N-octyl bicycloheptene dicarboximide (or MGK 264); ~~and the carbamate carbaryl.~~

6. Pages D-30 and D-31, Attachment D, section VI.B: revise subject heading, the first paragraph, and the first sentence of the second paragraph as shown below.

Establishing Receiving Water Limitations and Receiving Water Monitoring Triggers

In pesticide applications for vector control, it is reasonable to conclude that some residual pesticides will be deposited in surface waters. These residual pesticides may cause toxicity to aquatic life. ~~However, information regarding residual pesticides deposited in the receiving water as a result of direct or spray applications for vector control is not adequate to develop receiving water limitations for individual and combinations of pesticides; therefore, this~~ This General Permit ~~only contains a~~ Receiving Water Limitation for malathion and Receiving Water Monitoring Triggers for the other active ingredients. The Receiving Water Limitation and Receiving Water Monitoring Triggers ~~monitoring triggers~~ will be used to assess whether the discharge of residual pesticides has the reasonable potential to cause or contribute to an excursion of a water quality standard, including numeric and narrative objectives within a standard. This General Permit includes an Instantaneous Maximum Receiving Water Monitoring Trigger for residual pesticides of concern.

The Instantaneous Maximum Receiving Water Limitations ~~Receiving Water Monitoring Triggers~~ are based on promulgated water quality criteria such as those provided in the CTR,

water quality objectives adopted by the State and Regional Water Boards in their water quality control plans, water quality criteria adopted by the ~~California Department of Fish and Game~~ CDFW, or water quality standards such as drinking water standards adopted by the California Department of Public Health.

7. Page D-31, Attachment D, section VI.B, third and fourth full paragraphs: Delete the active ingredients diflubenzuron, chlorpyrifos, bifenthrin, cyfluthrin, cypermethrin, and carbamate carbaryl. Delete permethrin from the list of active ingredients with Ambient Water Quality criteria and add it to the list of active ingredients with Instantaneous Maximum Receiving Water Monitoring Triggers.

The following is a detailed discussion of toxicity data, applicable water quality criteria, if available, and Receiving Water Monitoring Triggers, if required, for: 1) larvicides, including microbial larvicides (*Bti* and *B. sphaericus*), petroleum distillates, methoprene, temephos, ~~diflubenzuron~~, monomolecular films, and spinosad; and 2) adulticides, including organophosphate insecticides (~~chlorpyrifos~~, malathion, and naled), pyrethrin, pyrethroids (~~bifenthrin~~, cyfluthrin, cypermethrin, deltamethrin, etofenprox, lambda-cyhalothrin, permethrin, prallethrin, resmethrin, sumithrin), piperonyl butoxide (PBO), and N-octyl bicycloheptene dicarboximide (or MGK-264), ~~and carbamate (carbaryl)~~. Among these pesticides, only ~~chlorpyrifos~~, ~~cypermethrin~~, ~~carbaryl~~, malathion, and permethrin have has an Ambient Water Quality criteria. Thus, the Instantaneous Maximum Receiving Water Monitoring Trigger for temephos, naled, pyrethrin, ~~bifenthrin~~, ~~cyfluthrin~~, deltamethrin, etofenprox, lambda-cyhalothrin, permethrin, prallethrin, resmethrin, sumithrin, PBO, and MGK-264 is based on one-tenth of the lowest LC50.

This General Permit may be re-opened to add receiving water limitations if the monitoring result for ~~diflubenzuron~~, temephos, naled, pyrethrin, ~~bifenthrin~~, ~~cyfluthrin~~, deltamethrin, etofenprox, lambda-cyhalothrin, permethrin, prallethrin, resmethrin, sumithrin, PBO, and MGK-264 exceed the associated monitoring trigger.

8. Page D-35, Attachment D, section VI.B.1.e: delete the description and table for diflubenzuron and renumber subsequent descriptions and tables.

~~Diflubenzuron~~

~~Diflubenzuron was first registered as a pesticide in the United States in 1976. In September 1985, U.S. EPA issued a Registration Standard for diflubenzuron. Diflubenzuron is an insect growth regulator used to control leaf eating insect larvae. Diflubenzuron is used on cattle, citrus, cotton, mushrooms, ornamentals, standing water, forestry trees, and in programs for mosquito control. Formulations include a soluble concentrate, flowable concentrate, wettable powder, and pellets. Diflubenzuron is applied by airblast, aircraft, and hydraulic sprayers.~~

~~Toxicity data for diflubenzuron were obtained from the Ecotoxicity Database to assess toxicity of diflubenzuron to freshwater aquatic life. Table D-1 summarizes the toxicity data for diflubenzuron.~~

Table D1. Summary of Toxicity Data for Diflubenzuron

Test Species	Study Length	LC50 (µg/l)
Atlantic salmon	96 hr	50,000
Bluegill sunfish	96 hr	50,000
Bluegill sunfish	96 hr	135,000
Brook trout	96 hr	50,000
Channel catfish	96 hr	100,000
Grass shrimp	96 hr	0.64
Mysid	96 hr	2.1
Rainbow trout	96 hr	100,000
Rainbow trout	96 hr	140,000
Scud	96 hr	45
Sheepshead minnow	96 hr	13
Sheepshead minnow	96 hr	130
Yellow perch	96 hr	25,000
Lowest LC50 = 0.64 µg/l		
Lowest LC50/10 = 0.064 µg/l		

Ambient Water Quality Criteria are unavailable for diflubenzuron. Table D-1 shows that one-tenth of the lowest LC50 to protect the most sensitive freshwater aquatic life for diflubenzuron is 0.064 µg/l. Therefore, this General Permit contains an Instantaneous Maximum Receiving Water Monitoring Trigger of 0.064 µg/l for diflubenzuron.

- Pages D-38 and D-39, Attachment D section VI.B.2.a.i: delete the description for chlorpyrifos and renumber subsequent descriptions.

Chlorpyrifos

Chlorpyrifos is an organophosphate insecticide, acaricide, and miticide used to control a variety of insects. It is used on food crops, feed crops, golf courses, wood treatment, and for mosquito control. Chlorpyrifos works by disrupting the insect's nervous system.

The California Department of Fish and Wildlife (CDFW) has previously assessed chlorpyrifos based on data from accepted tests and procedures outlined in U.S. EPA guidelines. CDFW assessed chlorpyrifos effects on aquatic organisms in the Sacramento-San Joaquin watershed. These tests have led CDFW to set water quality criteria of 0.014 µg/l as a continuous concentration (four-day average) and 0.02 µg/l as a maximum concentration (one-hour average) for freshwater aquatic life protection for chlorpyrifos. U.S. EPA has set water quality criteria of 0.041 µg/l as a continuous concentration (four-day

~~average) and 0.083 µg/l as a maximum concentration (one-hour average) for freshwater aquatic life protection for chlorpyrifos.~~

~~U.S. EPA has also set water quality criteria of 0.0056 µg/l as a continuous concentration (four-day average) and 0.011 µg/l as a maximum concentration (one-hour average) for saltwater aquatic life protection. CDFW has set water quality criteria of 0.009 µg/l as a continuous concentration (four-day average) and 0.02 µg/l as a maximum concentration (one-hour average) for saltwater aquatic life protection for chlorpyrifos. Based on this information, this General Permit contains Instantaneous Receiving Water Limitations for chlorpyrifos of 0.014 µg/l for freshwater and 0.0056 µg/l for saltwater, respectively.~~

~~Under Section 303(d) of the CWA, states, territories, and authorized tribes are required to develop a list of water quality limited segments. The waters on the list do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires for waters on the list that priority rankings be established for the development of action plans, called Total Maximum Daily Loads (TMDLs), to improve the water quality. A State Water Board approved list of California impaired waters impaired due to chlorpyrifos, as approved by the State Water Board, are shown at listed on http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml. Due to impairment by chlorpyrifos, this General Permit does not authorize the discharge of residual chlorpyrifos to the water bodies identified on the California 303(d) listing as impaired by chlorpyrifos.~~

- ~~10. Pages D-45 through D-47, Attachment D, sections VI.B.2.c.i through VI.B.2.c.iii: delete the descriptions and tables for bifenthrin, cyfluthrin, and cypermethrin. Renumber subsequent descriptions and tables.~~

~~Bifenthrin~~

~~Bifenthrin is a pyrethroid pesticide. Bifenthrin is used in a wide range of pesticides for insects and mites. For vector control purposes, bifenthrin is mainly used to control adult mosquitoes. Bifenthrin works by disrupting the normal functioning of the nervous system in an organism.~~

~~Bifenthrin can be used outdoors on residential, institutional, public, commercial, and industrial buildings; lawns; ornamentals; parks; recreational areas; and athletic fields.~~

~~Toxicity data for bifenthrin were obtained from U.S. EPA's Ecotoxicity Database to assess the toxicity of bifenthrin to freshwater aquatic life. Table D-5 below summarizes the toxicity data for bifenthrin.~~

Table D-5. Summary of Toxicity Data for Bifenthrin

Test Species	Study Length	LC50 (µg/l)
Bluegill sunfish	96 hr	0.35
Mysid	96 hr	0.00397
Rainbow trout	96 hr	0.15
Sheepshead minnow	96 hr	17.5
Lowest LC50 = 0.00397 µg/l		
Lowest LC50/10 = 0.000397 µg/l		

Ambient Water Quality Criteria are unavailable for bifenthrin. Table D-5 shows that one-tenth of the lowest LC50 to protect the most sensitive freshwater aquatic life for bifenthrin is 0.000397 µg/l. Therefore, this General Permit contains an Instantaneous Maximum Receiving Water Monitoring Trigger of 0.000397 µg/l for bifenthrin.

Cyfluthrin

Cyfluthrin is a synthetic pyrethroid. Its primary agricultural uses have been for control of insects on crops such as cotton, turf, ornamentals, hops, cereal, corn, fruit, peanuts, potatoes, and other vegetables. Cyfluthrin is also used for public health protection situations and for structural pest control.

Cyfluthrin-based insecticide formulations are available in the form of emulsifiable concentrates, wettable powder, aerosol, granules, liquid, oil-in-water emulsion, and ULV oil spray. Cyfluthrin works by disrupting the insect's nervous system.

Toxicity data for cyfluthrin were obtained from U.S. EPA's Ecotoxicity Database to assess the toxicity of cyfluthrin to freshwater aquatic life. Table D-6 below summarizes the toxicity data for cyfluthrin.

Table D-6. Summary of Toxicity Data for Cyfluthrin

Test Species	Study Length	LC50 (µg/l)
Bluegill Sunfish	96 hr	0.998
Bluegill Sunfish	96 hr	0.566
Bluegill Sunfish	96 hr	0.28
Mysid	96 hr	0.0022
Mysid	96 hr	0.0023
Rainbow trout	96 hr	0.209
Rainbow trout	96 hr	0.302
Rainbow trout	96 hr	0.085

Test Species	Study Length	LC50 (µg/l)
Rainbow trout	96 hr	0.068
Rainbow trout	96 hr	0.111
Lowest LC50 = 0.0022 µg/l		
Lowest LC50/10 = 0.00022 µg/l		

Ambient Water Quality Criteria are unavailable for cyfluthrin. Table D-6 shows that one-tenth of the lowest LC50 to protect the most sensitive freshwater aquatic life for cyfluthrin is 0.00022 µg/l. Therefore, this General Permit contains an Instantaneous Maximum Receiving Water Monitoring Trigger of 0.00022 µg/l for cyfluthrin.

Cypermethrin

Cypermethrin is a synthetic pyrethroid insecticide. Cypermethrin is registered for control of a wide range of pests such as mosquitoes, ants, cockroaches, fleas, and other insects. Cypermethrin works by affecting the insect's central nervous system.

Cypermethrin is formulated as an emulsifiable concentrate, a soluble concentrate/liquid, and a wettable powder. Cypermethrin is compatible with a number of insecticides and fungicides, and has been formulated in products with two or more active ingredients. Application can be made by aircraft and airblast equipment for large outdoor area. Applications at industrial, commercial, and residential sites can be made by low pressure devices such as backpack sprayers, handwand sprayers, and aerosol cans.

CDFW has set an interim water quality criterion of 0.002 µg/l as a maximum concentration (one-hour average) for freshwater aquatic life for cypermethrin. The U.S. EPA IRIS reference dose as a drinking water level for cypermethrin is 70 µg/l.

Based on the above information, this General Permit contains a Receiving Water Limitation of 0.002 µg/l for cypermethrin.

11. Page D-47, Attachment D, VI.B.2.c.iv: revise last sentence of first paragraph.

Deltamethrin works by disrupting the insect's nervous system and will be used primarily for barrier applications.

12. Page D-49, Attachment D, VI.B.2.c.vi: add sentence to the end of second paragraph.

Lambda-cyhalothrin will be used primarily for barrier applications.

13. Page D-50, Attachment D, section VI.B.2.c.vii: add description and table for permethrin and renumber subsequent descriptions and tables.

U.S. EPA's freshwater Ambient Water Quality Criteria are unavailable for permethrin. Since CDFW has developed an interim maximum concentration criterion of 0.03 µg/L as a one-hour average to protect freshwater aquatic life for permethrin, this General Permit contains an Instantaneous Maximum Receiving Water Monitoring Trigger based on this criterion. Toxicity data for permethrin obtained from the Ecotoxicity Database to assess toxicity of permethrin to freshwater aquatic life are shown in Table D-8.

Table D-8. Summary of Toxicity Data for Permethrin

<u>Test Species</u>	<u>Study Length</u>	<u>LC50 (µg/L)</u>
<u>Bluegill sunfish</u>	<u>96 hrs</u>	<u>5.0</u>
<u>Rainbow trout</u>	<u>96 hrs</u>	<u>2.9</u>
<u>Fathead minnow</u>	<u>96 hrs</u>	<u>5.7</u>
<u>Scud</u>	<u>96 hrs</u>	<u>0.17</u>
<u>Sheepshead minnow</u>	<u>96 hrs</u>	<u>7.8</u>
<u>Pink Shrimp</u>	<u>96 hrs</u>	<u>0.22</u>
<u>Mysid</u>	<u>96 hrs</u>	<u>0.019</u>
<u>Lowest LC50 = 0.019 µg/L</u>		
<u>Lowest LC50/10 = 0.0019 µg/L</u>		

Table D-8 shows that one-tenth of the lowest LC50 to protect the most sensitive freshwater aquatic life for permethrin is 0.0019 µg/L. This value is lower than CDFW’s interim maximum concentration criterion of 0.03 µg/L as a one-hour average to protect freshwater aquatic life. Therefore, this General Permit contains an Instantaneous Maximum Receiving Water Monitoring Trigger of 0.0019 µg/L for permethrin.

14. Page D-58, Attachment D, section VI.B.2.f: delete the description for carbaryl.

Carbaryl

Carbaryl was first registered in the United States in 1959. Carbaryl is an N-Methyl Carbamate insecticide. Carbaryl controls a wide variety of insects, including moths, beetles, cockroaches, ants, ticks, and adult mosquitoes/adults. Carbaryl works by disrupting the insect’s nervous system. Products with carbaryl can be formulated as dust, wettable powders, liquid concentrates, granules, or baits. Carbaryl is used on many agricultural sites including fruit trees, nut trees, vegetables, and grain crops.

CDFW has established an ambient water quality criterion of 2.53 µg/l both as a continuous concentration (4-day average) and a maximum concentration (1-hour average) for freshwater aquatic life protection. U.S. EPA has established an ambient water quality criterion of 2.1 µg/l that applies to both the criterion maximum concentration and criterion continuous concentration for freshwater aquatic life protection.

CDFW used acute toxicity data from U.S. EPA scientific literature and laboratory reports to determine the continuous concentration and maximum concentration for saltwater aquatic life protection. CDFW evaluated the quality of these data by evaluating the test type, method, design, species, and for water quality standards. CDFW has established an ambient water quality criterion of 0.81 µg/l both as a continuous concentration (four-day average) and a maximum concentration (one-hour average) for saltwater aquatic life protection for carbaryl. U.S. EPA has established an ambient water quality criterion of 1.6 µg/l as a criteria maximum concentration for saltwater aquatic life protection. Based on this

information, this General Permit contains a Receiving Water Limitation of 0.81 µg/l for freshwater and 1.6 µg/l for saltwater for carbaryl.

15. Page D-59, Table D-17, Summary Receiving Water Limitations: delete chlorpyrifos, cypermethrin, and carbaryl from the table.

Table D-16. Summary Receiving Water Limitations

Ingredient	Unit	Instantaneous Maximum	Basis
Chlorpyrifos	µg/L	0.014 (Freshwater)	CDFW's Ambient Criterion
		0.0056 (Saltwater)	CDFW's Ambient Criterion
Cypermethrin	µg/L	0.002	CDFW's Ambient Criterion
Carbaryl	µg/L	0.81 (Freshwater)	CDFW's Ambient Criterion
		1.6 (Saltwater)	CDFW's Ambient Criterion
Malathion	µg/L	0.1	U.S. EPA's Ambient Water Quality Criteria

16. Page D-59, Table D-18, Summary of Receiving Water Monitoring Triggers: Delete diflubenzuron, bifenthrin, and cyfluthrin from the table. Change permethrin's instantaneous maximum monitoring trigger to 0.0019 µg/L and basis language to U.S. EPA's Office of Pesticides' Ecotoxicity Database.

Table D-17. Summary of Receiving Water Monitoring Triggers

Ingredient	Unit	Instantaneous Maximum Monitoring Triggers	Basis
Diflubenzuron	µg/L	0.064	U.S. EPA's Office of Pesticides' Ecotoxicity Database
Temephos	µg/L	8	U.S. EPA's Office of Pesticides' Ecotoxicity Database
Naled	µg/L	0.014	U.S. EPA's Office of Pesticides' Ecotoxicity Database
Pyrethrin	µg/L	0.14	U.S. EPA's Office of Pesticides' Ecotoxicity Database
Bifenthrin	µg/L	0.000397	U.S. EPA's Office of Pesticides' Ecotoxicity Database
Cyfluthrin	µg/L	0.00022	U.S. EPA's Office of Pesticides' Ecotoxicity Database
Deltamethrin	µg/L	0.00017	U.S. EPA's Office of Pesticides' Ecotoxicity Database

Ingredient	Unit	Instantaneous Maximum Monitoring Triggers	Basis
Etofenprox	µg/L	0.0019	U.S. EPA's Office of Pesticides' Ecotoxicity Database
Lambda-Cyhalothrin	µg/L	0.00041	U.S. EPA's Office of Pesticides' Ecotoxicity Database
Permethrin	µg/L	0.03 <u>0.0019</u>	CDFW Ambient Criterion <u>U.S. EPA's Office of Pesticides' Ecotoxicity Database</u>
Prallethrin	µg/L	0.39	U.S. EPA's Office of Pesticides' Ecotoxicity Database

17. Page D-60, Table D-19, Persistence of Vector Larvicides Active Ingredients: delete diflubenzuron from the table.

Table D-19. Persistence of Vector Larvicides Active Ingredients

Class	Active Ingredient	Half-Life	Degradation Method (and Matrix)	Reference
Microbial ¹	<i>Bacillus Thuringiensis</i>	1-4 days	UV light (foliage)	EPA 1998
		Several months	Not reported (soil)	EPA 1998
	<i>Bacillus Sphaericus</i>	0.5-2 weeks	Not reported (formulated product)	EPA 1999
Surface Agents	Monomolecular Films ²	5-7 days	Not reported (water)	EPA 2007a
		5-22 days	Not reported (water)	Cognis Corporation 2004
	Petroleum Distillates ³	2-3 days	Not reported (water)	EPA 2007b

Table D-19. Persistence of Vector Larvicides Active Ingredients

Class	Active Ingredient	Half-Life	Degradation Method (and Matrix)	Reference
Insect Growth Regulator	Diflubenzuron	2 days	Aerobic metabolism (soil)	U.S. EPA 1997 (RED)
		34 days	Anaerobic metabolism (water)	
		Stable	Hydrolysis, pH=5-7	
		32 days	Hydrolysis, pH=9	
		Stable	Photolysis, pH=7 (water)	
		2-14 days	Anaerobic metabolism (soil)	
		34 days	Anaerobic metabolism (water)	

18. Page D-61, Table D-20, Persistence of Vector Larvicides Active Ingredients: delete chlorpyrifos, bifenthrin, cyfluthrin, cypermethrin, and carbaryl from the table.

Table D-19. Persistence of Vector Adulticides Active Ingredients

Active Ingredients		Half-Life		Degradation Method (and Matrix)	Reference
Organophosphates	Chlorpyrifos	29.6	Days	Photolysis (water)	Tuli A. 2013
		35-78	Days	Hydrolysis, pH=7 (water)	
		72.8	Days	Hydrolysis, pH=5 (water)	
	Malathion	0.1-11	Days	Aerobic metabolism (soil)	U.S. EPA 2009b (RED), Newhart 2006
		0.67-42	Days	Photodegradation (water)	U.S. EPA 2009b (RED)
		1-14	Days	Aerobic metabolism (water)	U.S. EPA 2009b (RED)
		Persistence		Anaerobic degradation (water)	U.S. EPA 2009b (RED)
		1.4-147	Days	Aerobic degradation (water)	Newhart 2006

**7/2/14 BD MEETING – ITEM #8
CHANGE SHEET #1 (CIRCULATED 6/27/14)**

Active Ingredients		Half-Life		Degradation Method (and Matrix)	Reference
Organophosphates	Naled	<2	Days	Hydrolysis & biodegradation (water & soil)	U.S. EPA 2006d (RED)
		“high”		Volatilization (soil)	U.S. EPA 2006d (RED)
Pyrethrins (naturally occurring chemicals in pyrethrum)	Pyrethrins ¹	<1	Day	Photolysis (water and soil)	U.S. EPA 2006a (RED), Gunasekara 2005
		14-17	Hrs	Hydrolysis, pH=9 (water)	U.S. EPA 2006a (RED)
		86.1	Days	Anaerobic metabolism (soil)	U.S. EPA 2006a (RED)
		10.5	Days	Aerobic metabolism (soil)	U.S. EPA 2006a (RED)
		1.8-97	Days ²	Volatilization (soil)	Gunasekara 2005
		“slow”		Hydrolysis, neutral or acidic	U.S. EPA 2006a (RED)
Pyrethroids (synthetic)	Bifenthrin	97-156	Days	Anaerobic	Fecko 1999 Environmental Fate of Bifenthrin
		65-125	Days	Aerobic	
		275-416	Days	Photolysis (water)	
	Cyfluthrin	493	Days	Hydrolysis, pH=7 (water)	Casjens Environmental Fate of Cyfluthrin
		12.2	Days	Photolysis, pH=5 (water)	
	Cypermethrin	Stable		Photolysis (water)	Jones Environmental Fate of Cypermethrin
		>50	Days	Hydrolysis, natural water (water)	
	Deltamethrin	Stable		Hydolysis, pH=5-7	Melendez, J. and Sappington K. 2013
		2.5	Days	Hydolysis, pH=9	
		64-84	Days	Photolysis (water)	

**7/2/14 BD MEETING – ITEM #8
CHANGE SHEET #1 (CIRCULATED 6/27/14)**

Active Ingredients	Half-Life	Degradation Method (and Matrix)		Reference	Active Ingredients	
Pyrethroids (synthetic)	Etofenprox	4.4	Days	Photolysis (soil)	Central Life Sciences 2009	
		1.7	Days	Photolysis (water)		
	Lambda- Cyhalothrin	Stable		Hydrolysis, pH= 5 & 7	L.M. He 2008 Environmental Fate of Carbaryl	
		8.66	Days	Hydrolysis, pH= 9		
		24.5	Days	Photolysis, pH= 5 (water)		
		53.7	Days	Photolysis (soil)		
		21.9	Days	Aerobic (water)		
		42.6	Days	Aerobic (soil)		
		Permethrin	Stable			Hydrolysis, pH= 5-7
	242		Days	Hydrolysis, pH= 9		Imgrund 2003
	125 – 350		Days	Aquatic degradation, pH= 9	U.S. EPA 2009a (RED),	
	113 – 175		Days	Anaerobic degradation (water)	U.S. EPA 2009a (RED),	
	51 -100		Days	Photolysis, pH= 5 (water)	Imgrund 2003	
	<3 -197		Days	Anaerobic degradation (soil)	Imgrund 2003	
	3.5 – 113		Days	Aerobic degradation (soil)	Imgrund 2003	
	104 – 324		Days	Photolysis (soil)	Imgrund 2003	
	<2.5		Days	Sediment/seawater degradation	Imgrund 2003	
	1.8 – 20.4		Days	Stream, pH= 7 -7.5, 13 -15°C	Imgrund 2003	
	19.6 -27.1		Days	Photolysis, ponds (water)	Imgrund 2003	

**7/2/14 BD MEETING – ITEM #8
CHANGE SHEET #1 (CIRCULATED 6/27/14)**

Active Ingredients		Half-Life		Degradation Method (and Matrix)	Reference	
Pyrethroids (synthetic)	Prallethrin	25	Days	Photolysis (soil)	Sumitomo Chemical 2009	
		13.6	Hours	Photolysis (water)	Sumitomo Chemical 2009	
	Resmethrin	22	Minutes	Photolysis (sea water)	U.S. EPA 2006b (RED)	
		47	Minutes	Photolysis (distilled water)	U.S. EPA 2006b (RED)	
		198	Days	Aerobic metabolism (soil)	U.S. EPA 2006b (RED)	
		37	Days	Aerobic metabolism (water)	U.S. EPA 2006b (RED)	
		Stable		Anaerobic metabolism (soil)	U.S. EPA 2006b (RED)	
		> 89	Days	Hydrolysis, pH= 5-9	U.S. EPA 2006b (RED)	
	d-phenothrin (Sumithrin)	6.5	Days	Photolysis (water)	U.S. EPA 2008 (RED)	
		18.6 - 25.8	Days	Aerobic metabolism (soil)	U.S. EPA 2008 (RED)	
		36.1	Days	Aerobic metabolism (water)	U.S. EPA 2008 (RED)	
		173.3	Days	Anaerobic metabolism (water)	U.S. EPA 2008 (RED)	
		Stable		Hydrolysis, all pH levels	U.S. EPA 2008 (RED)	
	Synergist for pyrethrin and pyrethroids	Piperonyl Butoxide (PBO)	8.4	Hours	Photolysis (water)	U.S. EPA 2006c (RED)
			“very slow”		Hydrolysis & aerobic/anaerobic metabolism	U.S. EPA 2006c (RED)

Active Ingredients		Half-Life		Degradation Method (and Matrix)	Reference
N-Methyl Carbamate	Carbaryl	>1500	Days	Hydrolysis, pH=5	Xu Environmental Fate of Carbaryl
		12.1	Days	Hydrolysis, pH=7	
		3.2	Hours	Hydrolysis, pH=9	
		21	Days	Photolysis, pH=5 (water)	
		41	Days	Photolysis (soil)	
		4-17	Days	Aerobic (soil)	